

APPENDIX B

ATMOSPHERIC FLUIDIZED BED COMBUSTORS

1.0 INTRODUCTION

This appendix includes data gathered on AFBC units. The objective of this exercise was to present the relationship between the development of the technology over time with respect to the capital cost. The relationship of technology maturity to price per kW could then be applied to the development of the clean coal technology presented in the main portion of this document.

This presentation of data on AFBC plants is based on information available from various sources. This information is a presentation of costs, plant components, and environmental controls; no attempt was made to develop operating costs for each of the plants. The Utility Data Institute, which provided a majority of the costing information, provides capital cost data in the year dollars the plant was constructed. There is no scope breakdown of the capital cost.

2.0 DATA

Cost data and unit size were gathered for AFBC's. Figure 1 shows the size of AFBC's built and the year of operation. Figure 2 presents the costs levelized to 1996 constant dollars. The cost data presented in Figure 2 include funds during construction.

Various attempts were made to normalize the data presented in Figure 2 to determine a predictable trend, rather than the scatter shown in Figure 2. Figures 3 and 4 segregate the data. Figure 3 shows all AFBC units between 20 and 100 MW, while Figure 4 shows all units greater than 100 MW. Figure 5 shows the capital cost of all AFBC units in 1996 constant dollars and normalized to a 1.0 labor factor, thereby eliminating regional workforce differences.

Further attempts were made to segregate the data. Figures 6 and 7 have the data normalized to two plant sizes; all facilities smaller than 100 MW were normalized to 50 MW, and all greater than 100 MW were normalized to 200 MW. The costs shown are levelized to 1996 constant dollars.

3.0 ANALYSIS

As previously stated, attempts were made to normalize all the data. Labor factors were utilized to equate the plant to a national average labor factor. Figure 8 presents the labor factors. All cost data gathered from published sources are in the year dollars that the plant came on line. These costs were escalated to 1996 constant dollars by use of the Handy-Whitman formula.

Figures 1 through 7 show scatter plots; there is no definite trend presented in the costs of building AFBC units even though we know the price of the components has decreased over time. Therefore, it was expected that the plots would have shown decreasing plant costs as the technology became commercially available and proven. The fact that no relationship is shown in the plots indicates that the site-specific components, environmental regulations, and the scope of work included in the cost numbers reported are a major influence.

Plant costs are dependent on technology, time frame, and site. Increasing environmental regulations will cause more expensive permitting, which may or may not have been included in the presented costs. The time frame in which the plant was built could have a significant impact on the capital cost, and the use of union or nonunion labor will also have a significant impact. The location in which the plant is built could also have a significant impact other than the labor rate, which we have normalized, because construction techniques differ depending upon the region. In the South, structures may be left open, and neither heat tracing nor train thawing is required. However, in the North, structures are enclosed, and the facility requires more insulation, as well as heat tracing or freeze protection. In addition, cogeneration steam may be produced by these facilities, thus decreasing the reported energy output.

The most significant factor influencing the data presented herein is the scope of the costs reported. We have no way of equalizing all costs reported to include similar items. Permitting and licensing may or may not be included. Civil amenities (e.g., fence, road, railway, geotechnical liners, etc.) may or may not be included. Byproduct (e.g., boiler slag, fly ash) disposal areas may or may not be included. A second unit on an existing site will have lower capital costs reported, due to site facilities already being in place.

4.0 CONCLUSION

The data presented are capital cost data, with little supporting information. All attempts at normalizing or levelizing the data to get a true trend analysis failed. The data are historical, which provides relationships between data points; however, to get a true trend of the development of one of the first clean coal technologies to commercialize, more information is required. The relationship between technology maturity and capital cost was not shown in the data gathered.

Figure 1

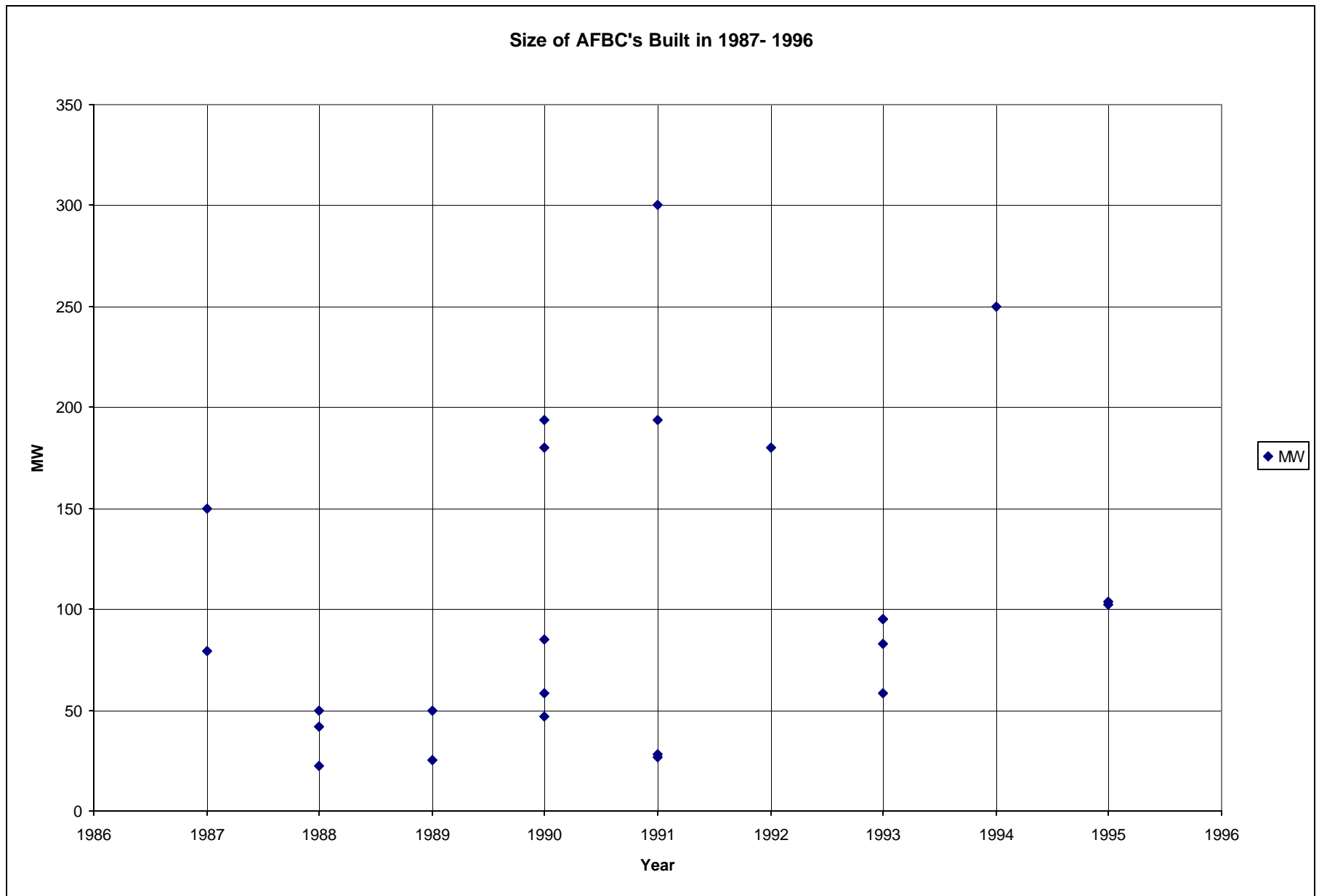


Figure 2

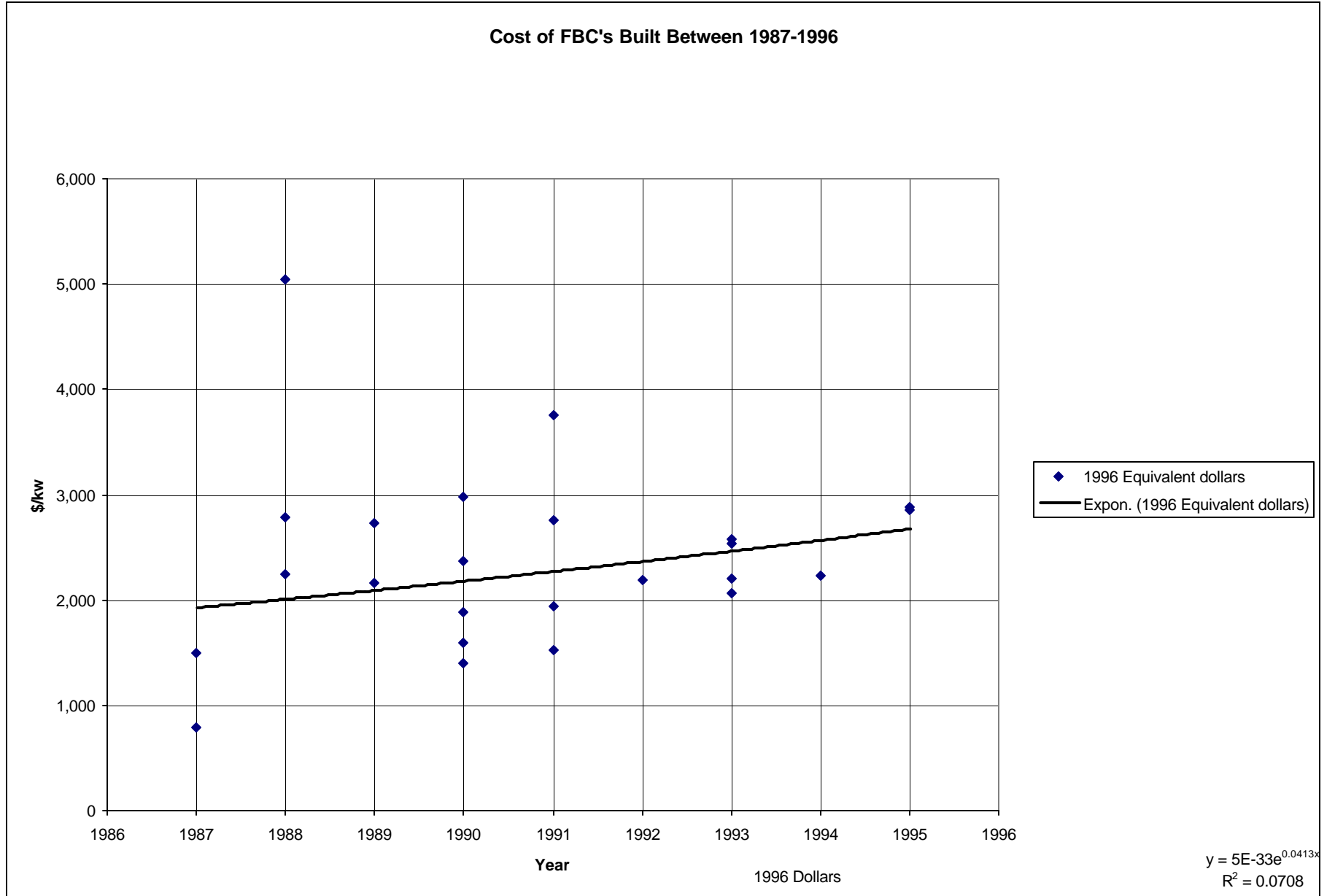


Figure 3

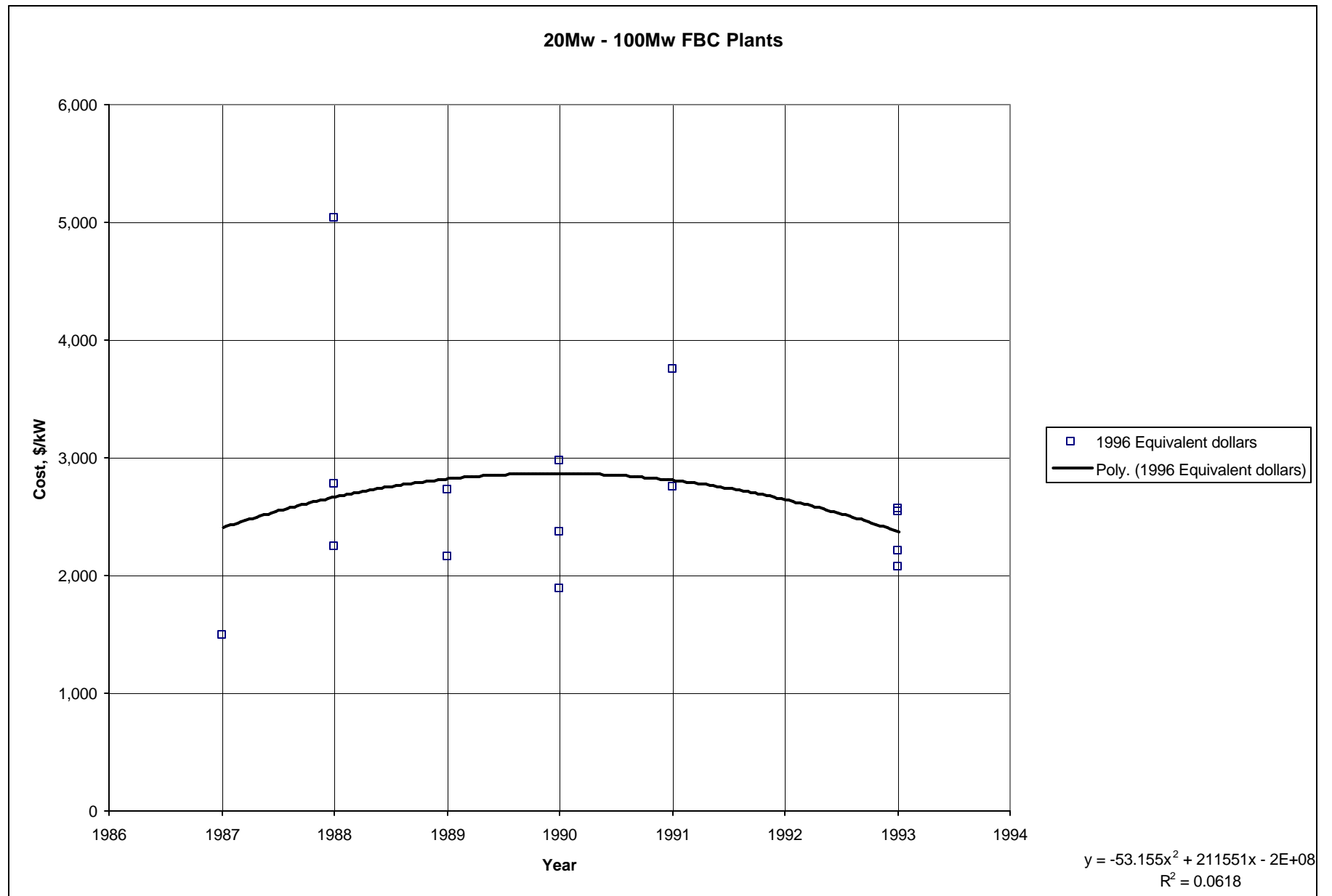


Figure 4

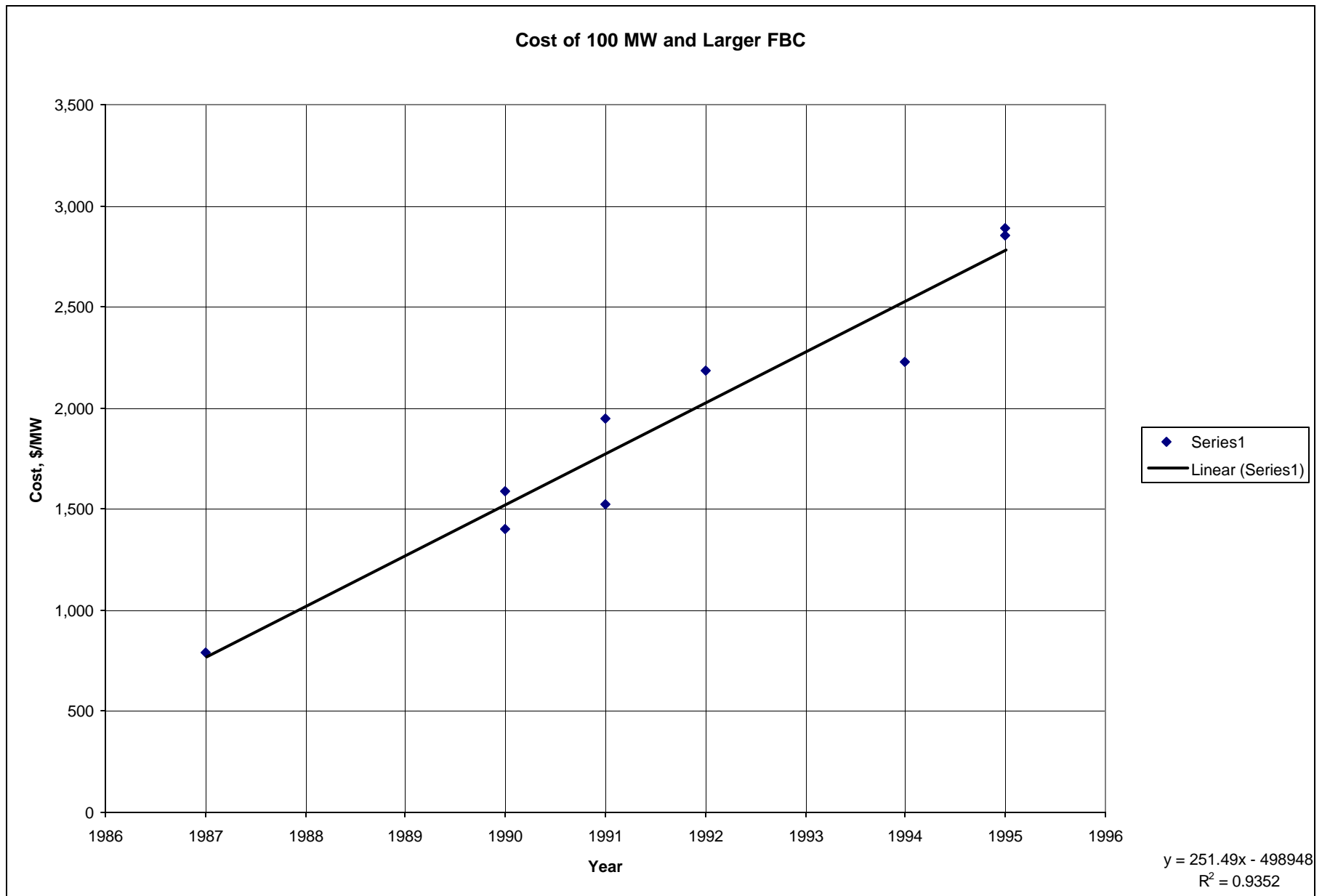


Figure 5

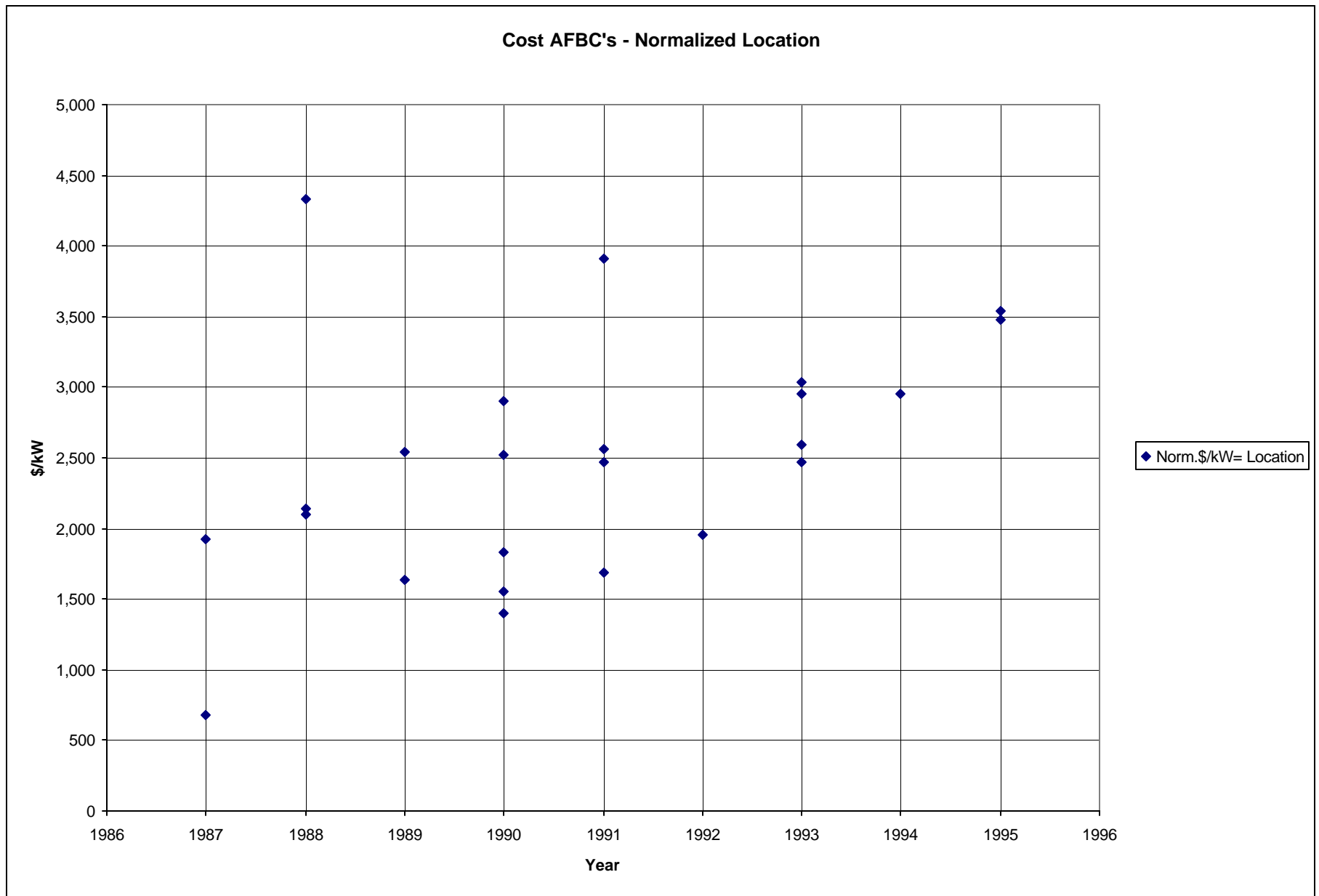


Figure 6

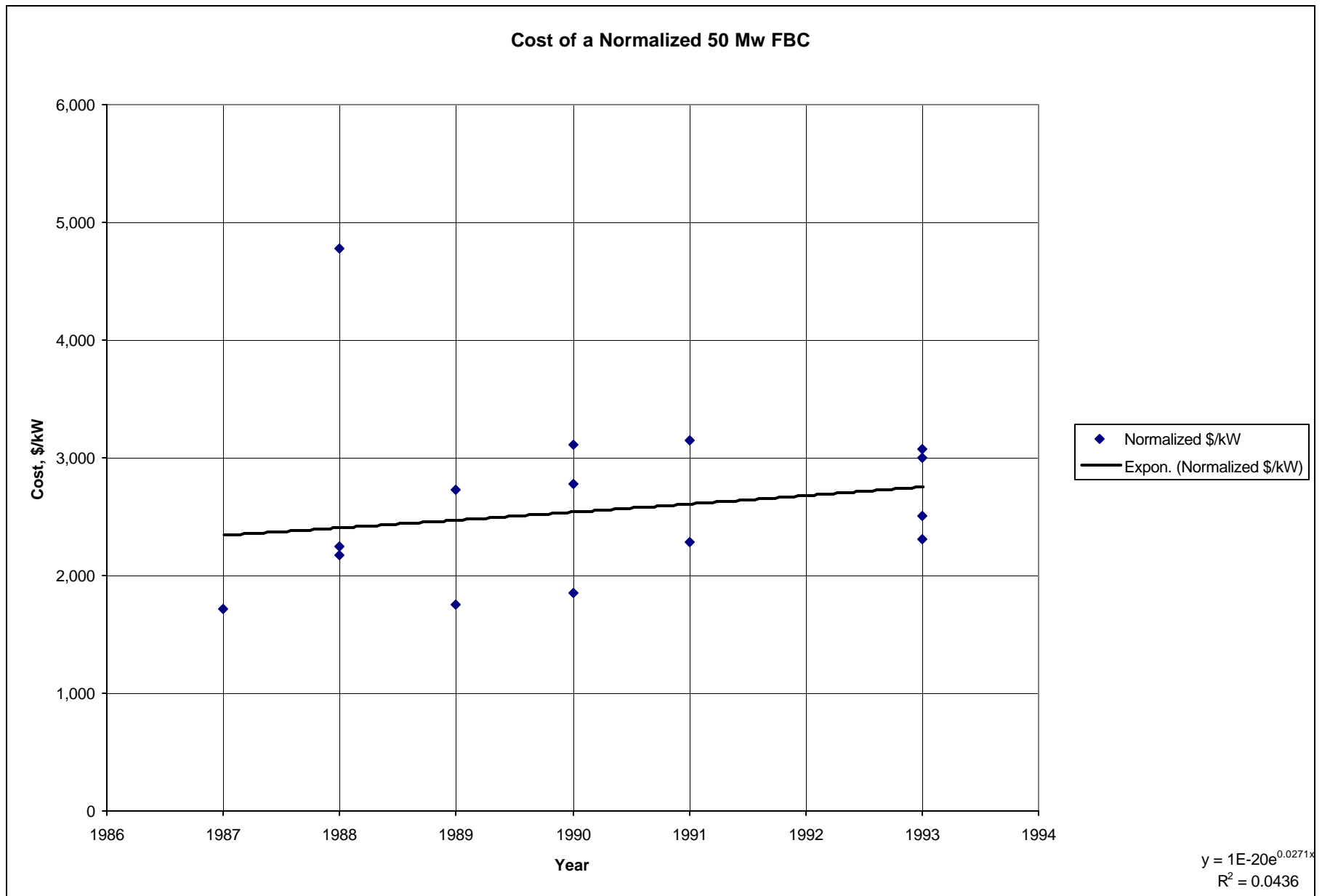


Figure 7

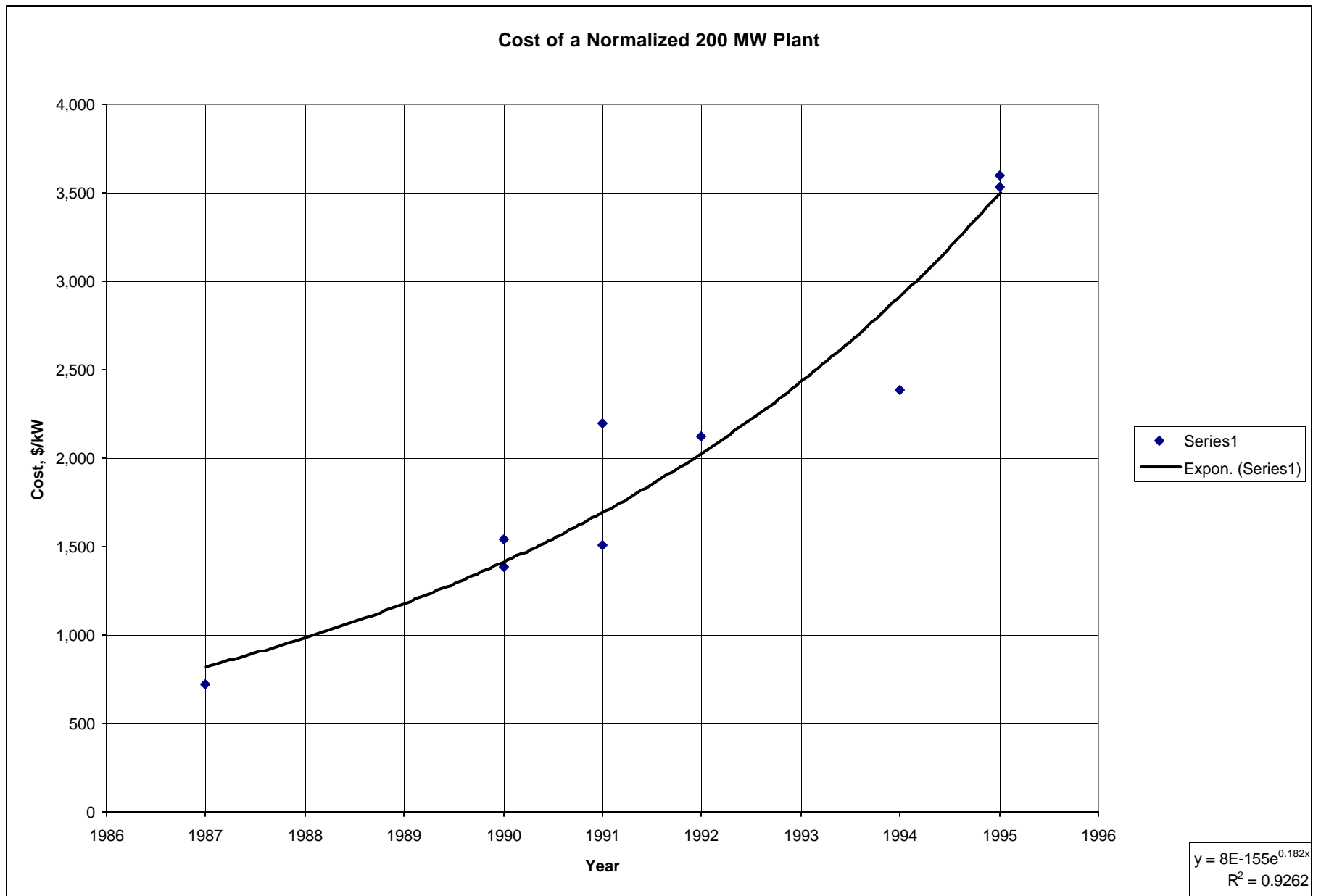


Figure 8

REGIONAL CONSTRUCTION LABOR FACTORS

Northeast	0.727802
Ohio River Valley	0.957854
Southeast	1.686341
Midwest	0.825764
Central	0.935454
South Central	1.347709
West Coast	0.809061
Northwest	0.94518
Hawaii	0.773395